

oleic series, we have in this chapter brief descriptions of glycerol (nitroglycerol and dynamite), the fatty acids from butyric upwards, and the acrylic series from oleic acid upwards. The descriptions of the acids are concisely given, and their occurrence, preparation, and physical properties briefly described. Of the chemistry of the higher homologues of the acids of these series but little is known, and the name of the acid which heads each paragraph is simply followed by its empirical formula. This treatment is all that is necessary in such a work as the present, but it will certainly occur to the more advanced chemical readers that a very wide field of investigation is offered to those who interest themselves with the question of isomerism among these complicated compounds. Considering the cheapness and abundance of the commoner animal and vegetable oils in daily use it does appear somewhat remarkable that more work has not been bestowed upon them by scientific chemists, and that the information which we have concerning them should be almost confined to their commercial testing and valuation.

Animal oils, fixed and volatile, are described in the second chapter, the former being divided into animal oils proper (butter-fat, lard, neat's foot, tallow, &c.), fish oils (cod-liver, seal, sperm, whale, &c.), and insect oils (niin, ant-grease, &c.). Among the volatile oils of this class we have bone-oil, castoreum, and civet oils (animal), and ambergris (fish). The third and fourth chapters are devoted to vegetable oils, a list of 19 drying and 23 non-drying oils being given. Linseed and olive oils, the most important members of this group, naturally claim the largest amount of space, and the technology of these products is well treated of. The volatile vegetable oils are very fully dealt with, no less than 56 pages being devoted to their consideration. After a description of the various methods of extraction by distillation, solvents, &c., the oils themselves are described individually according to their vegetable sources, the botanical names of the class and order being followed by a descriptive list of the oils obtained from each group of plants. Thus under *Aurantiaceæ* we have the oils of bergamot, cedrat, citron, lemons, limes, neroli, and orange; under *Caryophyllaceæ*, cajeput and clove oils, and so forth.

In the fifth chapter, empyreumatic, medicated, mixed, and perfumery oils are treated of. We give a specimen of the editor's conscientiousness in his description of medicated oils:—"EARTH WORM OIL. *Syn. Oleum. lumbricorum* (E. Ph. 1744). Washed earthworms,  $\frac{1}{2}$  lb.; olive oil  $1\frac{1}{2}$  pint; white wine,  $\frac{1}{2}$  pint. Boil gently till the wine is consumed, and press and strain." We are not informed what special merit is possessed by this gruesome concoction, but it was no doubt applied in good faith in the last century. Under "mixed oils" will be found a collection of strange mixtures, some of which might have formed ingredients in that "charm of powerful trouble" brewed by the witches in Macbeth. The familiar "nine oils" of the past generation of housewives, and even furniture oil, find place herein, together with some three dozen others. Chapter VI. contains an account of waxes, which are classed as animal, vegetable, and artificial, a useful method of distinguishing these substances by their behaviour with chloroform concluding the section.

The seventh chapter, a somewhat lengthy one, is

devoted to mineral oils, viz. those obtained by the distillation of shales, coal, lignite, and peat, and those found naturally formed in various parts of the world. The treatment of coal tar and the petroleum industries are well described, and the chapter concludes with sections on the storage of petroleum and the construction of petroleum lamps. Oil refining is treated of in the eighth chapter, which is a short one—almost too short considering the large number of processes which are now or have been formerly in use. The methods for refining tallow, wax, petroleum, and resin oil are included in this chapter, besides the purification and bleaching of animal and vegetable oils proper.

The longest chapter in the book is the ninth, which extends to 109 pages, and is devoted to the important subject of the testing of oils. This chapter is certainly a good one, both for thoroughness and the arrangement of its contents. Thus the testing of an oil may have for its object, the determination of purity, the lubricating efficiency, or the illuminating value. The purity may be ascertained by chemical or physical tests, both of which methods are very fully and lucidly treated of for each class of oils. Among physical tests are described the various methods of determining the specific gravity and melting point, cohesion figures, &c. The descriptions of the latter, which are quoted from a paper by Miss Crane, would have been of more value if figures had been given. The chemical tests, qualitative and quantitative, are given with great completeness. A figure of Abel's petroleum tester and the method of using it as prescribed by the Act of Parliament finds place in this section. For testing the lubricating value the machines of Stapfer, Thurston, and Bailey are described and figured; for viscosity the apparatus devised by Lamansky, and by Townson and Mercer; and for fluidity the apparatus of Bailey is also described and figured. The section on illuminating efficiency is not so full, and might be advantageously expanded in a future edition.

Chapter X. is devoted to resins and varnishes, and the last chapter contains descriptions of Mills' bromine absorption process and Hirscholm's method of testing resins. The appendix contains some useful tables of prices, of the amount and value of the export of seed oils during 1882, 1883, and 1884, and of the production of shale oil in the United Kingdom during the last five years.

From the foregoing epitome of the contents it will be seen that the volume, although a small one, gives a most comprehensive view of the subject of which it treats, and the amount of useful information which has been condensed into this small compass is mainly due to the concise mode of treatment which the editor has adopted. We can certainly recommend it to those for whom it is written.

R. MELDOLA

#### HARTLAUB ON THE MANATEES

*Beiträge zur Kenntniss der Manatus-Arten.* Von Dr. Clemens Hartlaub (Bremen). Separatabdruck a.d. *Zoologischen Jahrbüchern*, Band I. (1886.)

AMONGST other interesting articles with which Dr. Spengel's new zoological journal has commenced its career is one by Dr. Clemens Hartlaub (son of the

veteran ornithologist of the same name) which deserves special attention, as devoted to a somewhat neglected and imperfectly known group of the class of mammals—the Manatees or “sea-cows,” as they are popularly called. The Manatees constitute, as is well known, one of the three modern representatives of the formerly more extensive order of Sirenians, or “Herbivorous Cetaceans,” as they are sometimes, though not very correctly, denominated; for it is doubtful whether they have any near relationship to the true Whales. One of these three forms—the *Rhytina stelleri*—is already extinct; the other two—the Manatee and Dugong—are rapidly diminishing in numbers before the advancing tide of civilisation, and it is highly desirable that full details of their structure and habits should be obtained and recorded before they are “improved” off the face of the earth.

Dr. Hartlaub, having examined the skulls and other specimens of Manatees preserved in the various museums of the Continent, presents us with a *résumé* of his investigations in two well-ordered and well-illustrated essays. In the first of these he describes the skull of the African Manatee (*Manatus senegalensis*), and compares it bone by bone with that of the American *M. latirostris*, fully establishing the specific difference of the two forms, which has been doubted even by some of our most recent and best authorities.<sup>1</sup> In the second memoir he describes for the first time the skull of the South American *Manatus inunguis*, a species absolutely ignored by the great majority of naturalists, and shows its distinctness from *M. latirostris*.

It is hardly necessary even to recapitulate the points of difference between these three forms of Manatees, which Dr. Hartlaub has given at full length in these memoirs, and which seem to be sufficiently obvious on reference to his well-drawn figures. But a few words may be added on the geographical distribution of the three living Manatees, so far as this is at present known to us.

The African Manatee inhabits the west coast of that continent from the Senegal down to the Quanza, and penetrates up the larger rivers far into the interior. In the Senegal it has been recorded by Adanson, in the rivers of Liberia by Büttikofer, in the Niger and Benue by Barth and Vogel, in Gaboon by Du Chaillu, in the Lower Congo by Johnston and Pechnel-Loesche, and in the Quanza by Monteiro. Whether the “*Charuf el bachr*,” or water-sheep, ascertained to exist in the Uelle by Schweinfurth, which is probably the same as the supposed Manatee found in the Shari and Lake Tchad by Barth and other travellers, should be referred to *Manatus senegalensis*, or is even a Manatee at all, remains an interesting subject for future inquiry. But it seems tolerably certain that some sort of Sirenian inhabits the inland basin of Lake Tchad, and the probability is that it will turn out to be a *Manatus*.

In America the exact boundaries of the two species, *Manatus latirostris* and *M. inunguis*, cannot yet certainly be stated, owing to the confusion that has hitherto existed between these two forms. But it is certain that the Manatee occurs on the Atlantic coast of America from 25° N.L. to 19° S.L., and that those of the Antilles, the Gulf of Mexico, and Surinam, are referable to *M.*

*latirostris*. On the other hand, *M. inunguis* is only certainly known from the Amazons and its tributaries, where it was first discovered by Natterer. Dr. Hartlaub is inclined to believe that the Manatee of the coast and rivers of South-East Brazil must be likewise *M. inunguis*, but this does not seem to be probable. It is more likely, we think, to turn out that one species is found all along the Atlantic sea-board, penetrating only slightly up the rivers, while the other is confined to the interior, and is a purely fresh-water species.

#### OUR BOOK SHELF

*Infant-School Management.* By Sarah J. Hale. (London: Stanford, 1886.)

THIS is one of the best books on infant-school management that we have seen; the authoress knows exactly the kind of information infants can most readily assimilate, and how best to impart it; while on the other hand she is fully aware how dangerous and worse than useless the forcing process is.

The second part of the book consists of sketches of lessons in natural history, natural phenomena, food-plants, and common objects; and if science is to be taught in all our infant schools in the manner our authoress suggests, we may look forward to a largely increased taste for science in the rising generation.

Here is an extract from the introduction to the second part showing the method of teaching which she recommends:—

“In every case the teacher must bring plenty of illustration to bear upon the lesson. In natural history the *real animal* or a good picture, and if possible, some thing or things that it furnishes us with, as, for instance, the fur of the otter, the shell of the tortoise, the quills of the porcupine. Also the teacher should carefully provide herself with pictures of animals which afford strong contrasts to the one with which she is dealing, as well as those which bear some general resemblance to it, that she may exercise the *discriminative* as well as the *assimilative* faculty of her pupils. In all object lessons, various specimens of the object should be produced for examination and description; the little ones themselves must do the main part of the latter under the teacher's guidance, for these lessons are not only to enable the children to form new ideas, but they are also intended to train them in giving expression to such ideas. The teacher must make good use of the black-board, and should practise drawing objects, so that she may illustrate with facility and precision any particular point of her lesson which can be so illustrated. All the materials, pictures, diagrams, &c., which the teacher provides from time to time, should have their place in the school museum ready for future needs, and the children should be encouraged to bring contributions to such a museum, particularly such as the lessons they receive may suggest. Object-lesson cards, pictures, and all illustrations should be carefully used, and when not in use, have their proper places on wall or shelf. The teacher should arrange all specimens in the museum, and have each addition neatly labelled and catalogued.”

*A Year in Brazil.* By Hastings Charles Dent, C.E., F.L.S., F.R.G.S. With 10 Full-page Illustrations and 2 Maps. (London: Kegan Paul, Trench, and Co., 1886.)

THIS is a very interesting account of a year's sojourn in an interesting country, and although the author went out for a special purpose, to survey for a railway, every moment of his spare time was taken up in making collections and taking notes in most of the branches of natural history. The scientific interest of the book is mainly

<sup>1</sup> Cf. Flower, “Catalogue of Vertebrates” in the Museum of the Royal College of Surgeons, part 2, p. 528, 1884.